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Brief Counseling 5A Pharmacist with Illustrated Booklet Improves Outcomes in Anemic Pregnant Women: A Quasi-Experimental Study

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ABSTRACT

Background: Anemia during pregnancy remains a significant global health concern, affecting 25–50% of pregnant women worldwide. Although iron and folic acid supplementation programs (TTD) are widely implemented, adherence among pregnant women is frequently compromised due to various barriers
Method: A quasi-experimental study with a pre-post control group design was conducted across public health centers in Malang City. The intervention group received brief pharmacist counseling accompanied by illustrated booklets, while the control group received routine standard care.
Result: Post-intervention analyses indicated significant improvements in knowledge scores, increased adherence to TTD, and positive behavioral changes in the intervention group. Statistical assessment using the Wilcoxon Signed Rank test revealed significant differences between pre and post-test measurements for knowledge, adherence, and behavior ($p < 0.05$).
Conclusion: Brief pharmacist counseling supplemented with illustrated booklets resulted in substantial enhancements across all measured outcomes compared to standard care, underscoring the effectiveness of this intervention for managing anemia during pregnancy.

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INTRODUCTION

Anemia during pregnancy remains a major global public health concern. The World Health Organization (WHO) estimates that the prevalence of anemia among pregnant women is approximately 48.2% in Asia and 57.1% in Africa, with a global average ranging from 41.8% to 43.9% (Nurhajimah Nurhajimah et al., 2024). Overall, anemia in pregnancy affects 25–50% of the global population, with WHO reporting prevalence rates of 51% in developing countries and up to 14% in high-income nations (WHO, 2021). The highest burden is observed in South Asia and Central and West Africa. In Indonesia, the prevalence of anemia among pregnant women reaches 27.7%, according to data from the 2023 Indonesia Health Survey (SKI) (Kementerian Kesehatan RI, 2023).

Anemia is closely linked to childhood stunting. According to SKI 2023, one of the key contributors to stunting is inadequate maternal nutritional intake during pregnancy (Ida Bagus Eka Utama Wija et al., 2023; Kementerian Kesehatan RI, 2023). Stunting can begin in utero, where maternal nutritional status—even prior to conception—plays a crucial role in fetal growth and development. Pregnant women experiencing nutritional deficiencies are at higher risk of delivering low-birth-weight infants, a major determinant of stunting (Mantasia & Sumarmi, 2022). Iron deficiency also compromises children's cognitive development and physical growth, while optimal iron intake is essential for immune function, helping to reduce susceptibility to infections (Ida Bagus Eka Utama Wija et al., 2023).

According to the Ministry of Health, iron and folic acid (IFA) supplements for pregnant women are sourced from government programs as well as private procurement. Iron and folic acid (IFA) in Indonesian term is usually called Tablet Tambah Darah (TTD) (Dinas Kesehatan, 2023). Government-supplied IFA tablets are distributed through public healthcare facilities to targeted beneficiaries. Although access to IFA supplements is generally ensured, access alone does not guarantee consumption. Poor adherence often results from limited understanding of the benefits and potential risks associated with supplementation. Suboptimal adherence negatively affects maternal energy levels, productivity, and physical, mental, and immunological well-being. Maintaining adherence to IFA supplementation is therefore a key strategy for reducing the risk of adverse pregnancy outcomes.

Adherence to iron supplementation among pregnant women with anemia is influenced by multiple factors (Soraya et al., 2024). Despite the implementation of national IFA supplementation programs, adherence remains inadequate, contributing to persistent anemia among pregnant women. Non-adherence is frequently associated with insufficient knowledge, low motivation, and inadequate support systems—factors critical for improving adherence and, subsequently, hemoglobin levels. Previous studies in Indonesia have reported low adherence to IFA supplements, with one study showing that 68% of pregnant women had poor adherence (Maulidyanti & Sahiratmadja, 2023).

Government initiatives to reduce the high prevalence of anemia during pregnancy must be supported by improved maternal knowledge and adherence to preventive and therapeutic measures, including consistent consumption of IFA supplements. Pharmacists therefore play an essential role in addressing this issue (Anggreni, 2008; Fourianalistyawati, 2012). Counseling provided to pregnant women has been shown in several countries to significantly improve adherence to iron (Berhane & Belachew, 2022; Heryadi et al., 2017; Pai et al., 2013; Pratama et al., 2019; Vernissa et al., 2017a). According to the Indonesian Ministry of Health's Pharmaceutical Care Standards for Primary Health Centers, counseling is a core responsibility of pharmacists (Indonesian Ministry of Health, 2016). Pharmacists are expected to identify and address drug-related problems, empower patients to adopt positive self-management behaviors, and optimize therapeutic outcomes. Effective counseling improves patients' understanding of their conditions and treatments, thereby enhancing medication adherence (Puspitasari et al., 2009). However, limitations such as shortages of pharmaceutical personnel and high workload in primary health

centers often hinder the routine implementation of counseling activities (Supardi et al., 2011). As a result, alternative approaches are needed to ensure that patients receive essential medication-related information. One such alternative is brief counseling delivered by pharmacists (Kusumawardani et al., 2019a, 2021).

Over the past decade, numerous studies have examined the impact of various interventions aimed at improving adherence to iron supplementation among pregnant women. Examples include short-message service (SMS) reminders in Iran besi (Khorshid et al., 2014), and the use of iron–folate blister packaging among low- to middle-income communities (Byamugisha et al., 2022). In Indonesia, intervention studies have evaluated midwife counseling supported by illustrated booklets (Nahrisah et al., 2020a), mobile applications to promote IFA adherence (Rukmaini et al., 2019), leaflets and SMS reminders delivered by pharmacists (Anitasari & Andrajati, 2017)and illustrated leaflets (Heryadi et al., 2017) (Vernissa et al., 2017a). However, several interventions failed to improve anemia outcomes at the end of the study period (Byamugisha et al., 2022; Rukmaini et al., 2018). The evidence above highlights the need for more effective and behavior-oriented interventions for pregnant women to reduce anemia prevalence by enhancing knowledge and adherence to iron supplementation.

METHOD

Study Design

This study employed a quantitative pretest–posttest controlled design to compare outcomes between an intervention group and a control group. The intervention consisted of pharmacist-delivered 5A brief counseling supported by an illustrated educational booklet, while the control group received standard pharmaceutical care typically provided at community health centers (puskesmas).

Study Setting and Duration

The study was conducted across nine community health centers in Malang City, Indonesia: Dinoyo, Ciptomulyo, Kendalsari, Rampal Celaket, Mulyorejo, Polowijen, Janti, Kedungkandang, and Mojolangu. Data collection took place between December 2023 and March 2024. These sites were selected based on their willingness to participate and their capacity to support the study procedures.

Population and Sample

The study population consisted of pregnant women diagnosed with anemia who attended antenatal care (ANC) services at the selected puskesmas. Sample size estimation was conducted using OpenEpi software based on Kelsey's formula for two-group comparative studies. The calculation incorporated an estimated prevalence of anemia among pregnant women of 48,9%, a significance level (α) of 0,05, a statistical power of 80% ($\beta = 0,20$), and an assumed odds ratio (OR) of 4, as reported in previous literature (Kusumawardani et al., 2019b). Based on these assumptions, the minimum required sample size was determined to be 40 participants per group, resulting in a total of 80 pregnant women. Participants were subsequently recruited using a purposive sampling technique

Inclusion and Exclusion Criteria

Inclusion criteria for this research such as pregnant women with hemoglobin levels < 11 g/dL confirmed through laboratory testing at the puskesmas, aged ≥18 years, in any trimester of pregnancy (I–III), receiving ANC services at the participating puskesmas, able to understand and communicate in Indonesian, willing to undergo posttest hemoglobin measurement, and willing to participate from pretest to posttest. Exclusion criterias such as pregnant women who declined participation and those experiencing significant obstetric complications during data collection.

Research Instruments

Questionnaire

A structured questionnaire was used to collect data, consisting of five sections: (1) Sociodemographic characteristics, (2) Pregnancy-related factors, (3) Knowledge about anemia and iron–folic acid (IFA) supplementation, (4) Behavioral stages of adherence based on the Transtheoretical Model (TTM), (5) IFA adherence, adapted and modified from previously validated instruments (Atmadani et al., 2025). Validity testing included Pearson product–moment correlation, convergent and divergent validity, and reliability analysis using Cronbach's alpha.

Illustrated Booklet

An illustrated educational booklet was developed based on a literature review of iron-deficiency anemia management. The booklet included definitions, risk factors, symptoms, prevention strategies, treatment options, dietary recommendations, and guidance for consuming iron supplements. Culturally tailored illustrations depicting pregnant Muslim women were incorporated to enhance engagement. Qur'anic verses related to seeking treatment were included for cultural resonance.

The booklet served as a supporting tool during the brief counseling sessions. It was provided to the intervention group during the study and to the control group after completion.

Counseling Module

The counseling module contained structured steps for delivering the 5A brief counseling (Assess, Advise, Agree, Assist, Arrange), tailored to the participant's stage of behavioral change according to TTM. The module was adapted from Kusumawardani's 2019 thesis and further refined using qualitative data obtained in the preliminary phase of this study. This module ensured consistency across pharmacists conducting the intervention.

Variables

Sociodemographic Characteristics

Sociodemographic variables describe the social and economic background of the respondents. These include maternal age, education level, occupation, and income, all measured using nominal scales. Age was categorized into 18–30 years and >30 years. Education was classified into basic–secondary and higher education. Occupation was categorized as employed or unemployed, while income was grouped into IDR 1–2 million and >2 million. These classifications provide an overview of respondents' baseline characteristics (Sendeku et al., 2020; Tegodan et al., 2021).

Pregnancy-Related Factors

Pregnancy factors include current pregnancy status, previous pregnancy history, and medical history (Obsa et al., 2021; Pathiranthna, 2020; Yekta et al., 2008). Indicators for current pregnancy included gestational age, number of ANC visits, timing of first ANC visit, concurrent medications, and gravida status. Previous pregnancy indicators consisted of miscarriage history. Medical history covered anemia history and other illnesses present in the family. All variables were measured using nominal scales, categorized based on trimester, parity, ANC visit frequency, and disease history.

Knowledge

Knowledge refers to respondents' understanding of anemia and IFA supplementation (Fuady & Bangun, 2013; Kusumawardani et al., 2019a; Sendeku et al., 2020; Tegodan et al., 2021). It was measured using seven Guttman-scale items, with responses classified as correct or incorrect. Knowledge scores were categorized according to the median: scores ≤ median indicated low knowledge, and scores > median indicated high knowledge.

Stages of Behavioral Change

This variable reflects pregnant women's readiness to adhere to IFA supplementation based on cognitive, affective, and psychomotor domains (Kusumawardani et al., 2019b). The instrument consisted of nine Guttman-scale items. Behavioral stages were categorized into four phases: precontemplation, contemplation, preparation, and action, representing the respondent's progression toward adherence to IFA consumption.

Adherence

Adherence to IFA supplementation was assessed using eight Likert-scale items measuring consumption frequency, timing consistency, and regularity in obtaining the supplements (Abby et al., 2023; Kripalani et al., 2009). Adherence levels were categorized based on median scores: < median indicated low adherence, whereas ≥ median indicated high adherence.

Data Collection

Procedures for Intervention and Control Groups

Pregnant women with anemia in the control group received the usual care consisting of standard pharmacist counseling provided at the community health centers (puskesmas). In contrast, the intervention group received the 5A brief counseling model accompanied by an illustrated educational booklet containing information on anemia during pregnancy and the importance of IFA supplementation (iron and folic acid). The 5A brief counseling sessions were delivered by five pharmacists who had undergone specialized training conducted by experts in the 5A counseling method.

Pretest and Posttest Procedures

During both the pretest and posttest, respondents received a questionnaire package along with an informed consent form. The posttest was conducted one month after respondents in both groups received their respective interventions. Pretest, intervention, and posttest activities were conducted either through home visits or during ANC visits at the puskesmas.

Data Analysis

Bivariate analysis was conducted to determine correlations between two research variables and served as an extension of univariate analysis. Chi-square tests and Fisher's exact tests were used. The chi-square test described the frequency distribution and proportions of respondent characteristics in both groups using nominal data. It was also used to evaluate differences in the distribution of knowledge, adherence, and behavioral stage categories. Comparative analysis of numerical data was conducted to identify differences in mean scores between pretest and posttest within groups and to compare outcomes between the intervention and control groups. Data normality was assessed using the Kolmogorov–Smirnov test, which showed a non-normal distribution; therefore, non-parametric tests were applied. Wilcoxon Signed-Rank test was used for paired comparisons (pretest vs. posttest). Mann–Whitney U test was used for independent group comparisons (intervention vs. control).

Ethical Considerations

Administrative approval was obtained from the Ethics Committee of the Faculty of Medicine, Universitas Muhammadiyah Malang (KEPK FK UMM). The purpose, procedures, and expected outcomes of the study were explained to the participants. Participation was voluntary, and respondents were informed of their right to decline or withdraw at any time without consequences. Confidentiality of personal information was strictly maintained, and data were used solely for research purposes. Ethical clearance was granted by the Ethics Committee of the Faculty

of Medicine, Universitas Muhammadiyah Malang under approval number: No. E.5.a/229/KEPKUMM/VIII/2023.

RESULTS AND DISCUSSION

Results

Respondent Characteristics

A pretest was administered to 100 pregnant women with anemia using a structured questionnaire. The characteristics of respondents prior to the intervention are presented in Table 1.

Table 1. Respondent Characteristics

Variable	Total Respondents (N=100)	Control (n=50)	Intervention (n=50)	p-value
Age				0.373
18–30 years	28	16 (32%)	12 (24%)	
>30 years	72	34 (68%)	38 (76%)	
Education				0.817
Primary–Senior High School	75	37 (74%)	38 (76%)	
Higher Education	25	13 (26%)	12 (24%)	
Employment Status				0.147
Unemployed	63	28 (56%)	35 (70%)	
Employed	37	22 (44%)	15 (30%)	
Monthly Income				0.685
1–2 million IDR	42	20 (40%)	22 (44%)	
>2 million IDR	58	30 (60%)	28 (56%)	
ANC Visits				0.161
<4 visits	51	29 (58%)	22 (44%)	
≥4 visits	49	21 (42%)	28 (56%)	
History of Anemia in Previous Pregnancy				0.461
Yes	21	12 (24%)	9 (18%)	
No	79	38 (76%)	41 (82%)	
Current Medication Use				0.799
Yes	19	9 (18%)	10 (20%)	
No	81	41 (82%)	40 (80%)	
History of Miscarriage				0.461
Yes	21	12 (24%)	9 (18%)	
No	79	38 (76%)	41 (82%)	
Family History of Disease				0.032
Yes	23	7 (14%)	16 (32%)	
No	77	43 (86%)	34 (68%)	
Gestational Age				<0.001
First trimester	10	2 (4%)	8 (16%)	
Second trimester	33	9 (18%)	24 (48%)	
Third trimester	57	39 (78%)	18 (36%)	
Timing of First ANC Visit				0.072
Early pregnancy	49	20 (40%)	29 (58%)	
Late pregnancy	51	30 (60%)	21 (42%)	
Gravida				0.673
Primigravida	34	18 (36%)	14 (32%)	
Multigravida	66	32 (64%)	34 (68%)	

Table 1 shows that the majority of respondents were older than 30 years, had primary to secondary school education, were unemployed, and had an income above two million rupiah. Most respondents did not have a history of anemia, were not taking other medications, had no history of miscarriage or familial diseases, were in the third trimester, initiated ANC late in pregnancy, and were multigravida. Both groups demonstrated relatively similar characteristics; however, the intervention group appeared more proactive in seeking antenatal services, as reflected in differences in ANC visits, gestational age, and timing of ANC initiation. The intervention group also showed higher family support and perceived benefits.

Table 2. Items Analysis of Knowledge on Anemia and Iron-Folic Acid Supplements

Knowledge Item	Pretest Control n (%)	Pretest Intervention n (%)	Posttest Control n (%)	Posttest Intervention n (%)
1. Anemia is a condition in which hemoglobin levels are *higher* than normal.				
Correct	16 (32%)	13 (26%)	34 (79.1%)	34 (79.1%)
Incorrect	34 (68%)	37 (74%)	9 (20.9%)	9 (20.9%)
2. Iron tablets can be taken together with tea, coffee, milk, antacids, and calcium because they increase iron absorption.				
Correct	4 (8%)	4 (8%)	5 (11.6%)	1 (2.3%)
Incorrect	46 (92%)	46 (92%)	38 (88.4%)	42 (97.7%)
3. Low birth weight is a possible outcome for infants when the mother has anemia during pregnancy.				
Correct	39 (78%)	43 (86%)	33 (76.7%)	43 (100%)
Incorrect	11 (22%)	7 (14%)	10 (23.3%)	0 (0%)
4. Vitamin C inhibits the absorption of iron tablets during pregnancy.				
Correct	7 (14%)	7 (14%)	11 (25.6%)	4 (9.3%)
Incorrect	43 (86%)	43 (86%)	32 (74.4%)	39 (90.7%)
5. Black stools are a common side effect after taking iron tablets.				
Correct	34 (68%)	22 (44%)	22 (51.2%)	37 (86%)
Incorrect	16 (32%)	28 (56%)	21 (48.8%)	6 (14%)
6. The risk of anemia can be reduced by consuming iron-rich foods.				
Correct	47 (94%)	46 (92%)	39 (90.7%)	40 (93%)
Incorrect	3 (6%)	4 (8%)	4 (9.3%)	3 (7%)
7. Foods rich in iron include beef, chicken liver, shellfish, chicken, and green leafy vegetables.				
Correct	50 (100%)	49 (98%)	41 (95.3%)	43 (100%)
Incorrect	0 (0%)	1 (2%)	2 (4.7%)	0 (0%)

Table 2 demonstrates significant improvements in knowledge among participants in the intervention group compared with the control group. The most notable increases occurred in items with initially low baseline awareness, particularly those related to drug–food interactions (iron with tea, coffee, milk, and calcium), misconceptions about vitamin C, and recognition of black stools as a common side effect of iron supplementation. Items with high baseline understanding—such as iron-rich foods and the role of nutrition in preventing anemia—showed limited change,

reflecting a ceiling effect. By the posttest, the proportion of respondents with high knowledge increased dramatically in the intervention group (from 32.6% to 60.5%), whereas the control group showed a decrease (from 25.6% to 20.9%). This indicates that the illustrated booklet combined with 5A brief counseling effectively addressed knowledge gaps and corrected common misconceptions related to anemia and IFA supplementation.

Table 3. Mean Scores of Behavioral Change Domains

Behavioral Domain	Pretest Mean ± SD (Control)	Pretest Mean ± SD (Intervention)	Posttest Mean ± SD (Control)	Posttest Mean ± SD (Intervention)
Cognitive	2.2 ± 0.9	2.5 ± 0.6	2.5 ± 0.7	2.9 ± 0.4
Affective	2.6 ± 0.7	2.8 ± 0.4	2.8 ± 0.4	2.9 ± 0.3
Psychomotor	2.4 ± 1.0	2.3 ± 1.0	2.4 ± 1.0	2.2 ± 0.9

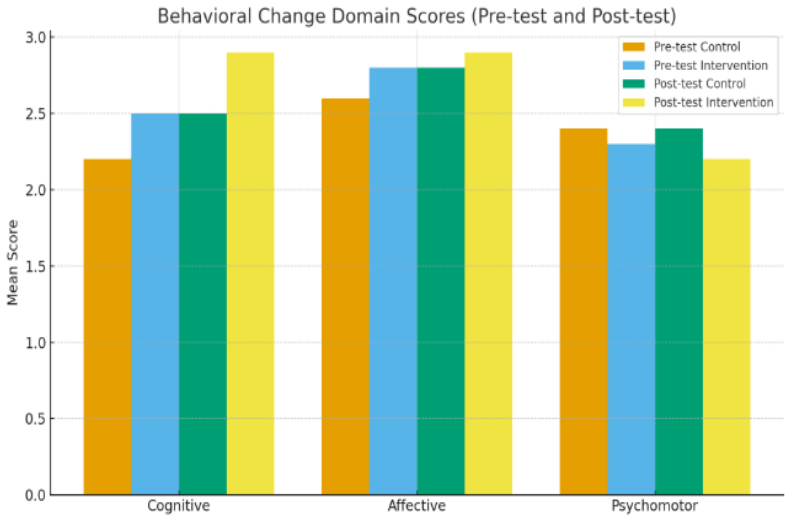

Figure 1. Mean Scores of Behavioral Change Domains

Table 3 reveals significant improvements in behavioral change among respondents in the intervention group following the educational intervention using the 5A brief counseling model combined with an illustrated booklet. In cognitive improvements, knowledge-driven behavior improved notably in the intervention group. Understanding the importance of consuming 90 iron tablets and combining iron supplements with vitamin C increased substantially (up to 95.3% posttest), indicating strengthened health literacy. Regarding affective enhancements, positive attitudes toward anemia seriousness and commitment to routine supplementation reached almost universal agreement in the intervention group (100%), demonstrating strengthened motivation and perceived health benefits. In psychomotor changes, the intervention group showed improved consistency in daily iron intake and reduced behavior of taking tablets only when symptomatic. The control group exhibited deterioration, especially a sharp rise in stopping iron tablets due to boredom (53.5%).

Table 4. Items Analysis of Adherence Towards Iron Folic Acid Supplement (TTD)

Adherence Item	Pretest Control n (%)	Pretest Intervention n (%)	Posttest Control n (%)	Posttest Intervention n (%)
1. How often do you forget to take your iron tablets?				
Never	12 (24%)	8 (16%)	7 (16.3%)	16 (37.2%)
Sometimes	30 (60%)	34 (68%)	24(55.8%)	23 (53.5%)
Often	8 (16%)	7 (14%)	11 (25.6%)	4 (9.3%)
Always	0 (0%)	1 (2%)	1 (2.3%)	0 (0%)
2. How often do you intentionally decide not to take your iron tablets?				
Never	27 (54%)	30 (60%)	16 (37.2%)	31 (72.1%)
Sometimes	16 (32%)	17 (34%)	19 (44.2%)	8 (18.6%)
Often	6 (12%)	2 (4%)	7 (16.3%)	4 (9.3%)
Always	1 (2%)	1 (2%)	1 (2.3%)	0 (0%)
3. How often do you forget to redeem your iron tablets from the health center?				
Never	40 (80%)	36 (72%)	30 (69.8%)	36 (83.7%)
Sometimes	7 (14%)	12 (24%)	6 (14%)	4 (9.3%)
Often	3 (6%)	1 (2%)	5 (11.6%)	3 (7%)
Always	0 (0%)	1 (2%)	2 (4.7%)	0 (0%)
4. How often do you run out of iron tablets at home?				
Never	42 (84%)	38 (76%)	31 (72.1%)	39 (90.7%)
Sometimes	5 (10%)	11 (22%)	10 (23.3%)	3 (7%)
Often	2 (4%)	1 (2%)	1 (2.3%)	1 (2.3%)
Always	1 (2%)	0 (0%)	1 (2.3%)	0 (0%)
5. How often do you skip taking your iron tablets?				
Never	16 (32%)	14 (28%)	11 (25.6%)	24 (55.8%)
Sometimes	27 (54%)	31 (62%)	26 (60.5%)	15 (34.9%)
Often	6 (12%)	3 (6%)	6 (14%)	4 (9.3%)
Always	1 (2%)	2 (4%)	0 (0%)	0 (0%)
6. How often do you avoid taking iron tablets because of boredom?				
Never	33 (66%)	35 (70%)	16 (37.2%)	35 (81.4%)
Sometimes	10 (20%)	13 (26%)	21 (48.8%)	4 (9.3%)
Often	7 (14%)	2 (4%)	5 (11.6%)	4 (9.3%)
Always	0 (0%)	0 (0%)	1 (2.3%)	0 (0%)
7. How often do you plan ANC visits before running out of iron tablets?				
Never	14 (28%)	19 (38%)	12 (27.9%)	9 (20.9%)
Sometimes	16 (32%)	15 (30%)	11 (25.6%)	7 (16.3%)
Often	12 (24%)	10 (20%)	16 (37.2%)	10 (23.3%)
Always	8 (16%)	6 (12%)	4 (9.3%)	17 (39.5%)
8. How often do you fail to obtain iron tablets from the health center (and do not buy them elsewhere)?				
Never	41 (82%)	39 (78%)	35 (81.4%)	39 (90.7%)
Sometimes	7 (14%)	5 (10%)	5 (11.6%)	4 (9.3%)
Often	2 (4%)	5 (10%)	1 (2.3%)	0 (0%)
Always	0 (0%)	1 (2%)	2 (4.7%)	0 (0%)

Table 4 shows substantial differences in adherence trends following the intervention. The data indicate that the intervention group experienced consistent improvement across nearly all adherence items, while the control group showed declines or stagnation. Across multiple adherence items, including forgetting to take tablets, intentional omission, failing to redeem tablets, running out of supplies, skipping doses, and avoiding tablets due to boredom, the proportion of participants reporting "Never" increased substantially in the intervention group during the posttest. For example, the frequency of "Never" forgetting to take tablets rose from 16% to 37.2%,

and "Never" intentionally skipping tablets increased from 60% to 72.1%. Similarly, adherence related to tablet procurement and planning ANC visits improved, with the intervention group showing higher consistency compared to the control group, which displayed minimal or negative changes.

Table 5. Comparison of Knowledge, Behavioral Change, and Adherence Score

Measurement Item (Total Score)	Control Group Mean ± SD	Intervention Group Mean ± SD	p-value*
Knowledge			
Pre-test	5.88 ± 0.82	5.70 ± 1.11	0.511
Post-test	5.56 ± 1.17	6.46 ± 0.79	<0.001
Per-Protocol Analysis (PPA) using Wilcoxon Signed-Rank Test	0.463	<0.001	
Behavior Change			
Pre-test	7.07 ± 1.86	7.60 ± 1.35	0.920
Post-test	7.30 ± 1.10	7.98 ± 1.21	<0.001
Per-Protocol Analysis (PPA) using Wilcoxon Signed-Rank Test	0.483	0.112	
Adherence			
Pre-test	26.94 ± 3.13	26.16 ± 2.97	0.157
Post-test	25.47 ± 3.26	28.47 ± 3.11	<0.001
Per-Protocol Analysis (PPA) using Wilcoxon Signed-Rank Test	0.023	<0.001	

Mann-Whitney U test significancy <0,01

Table 5 summarizes the comparison of mean scores for knowledge, behavior change, and adherence between the control and intervention groups at pre-test and post-test assessments. At baseline, no significant differences were observed between both groups across all variables. Knowledge scores were comparable between the control (mean 5.88 ± 0.82) and intervention (mean 5.70 ± 1.11) groups ($p = 0.511$). After the intervention, the intervention group demonstrated a significantly higher knowledge score (mean 6.46 ± 0.79) compared to the control group (mean 5.56 ± 1.17), with $p < 0.001$. The Per-Protocol Analysis confirmed significant improvement in the intervention group ($p < 0.001$), while no significant change was detected in the control group ($p = 0.463$). For behavior change, baseline scores were similar ($p = 0.920$). Post-test results showed a significant increase in the intervention group ($p < 0.001$), whereas the control group showed no significant improvement ($p = 0.483$). Adherence scores at pre-test were also not significantly different between the groups ($p = 0.157$). Following the intervention, adherence scores increased notably in the intervention group (mean 28.47 ± 3.11) compared to the control group (mean 25.47 ± 3.26), with $p < 0.001$. PPA results indicated significant improvement in both the control ($p = 0.023$) and intervention groups ($p < 0.001$), although the magnitude of improvement was substantially greater in the intervention group.

Table 6. Differences in Knowledge Categories, Adherence Categories, and Behavioral Change Stages (Control vs. Intervention)

Measurement Item	Control Group n (%)	Intervention Group n (%)	p-value*
Knowledge			
Pre-test			
Low Knowledge			0.610
High Knowledge	32 (74.4)	34 (79.0)	
Post-test	11 (25.6)	9 (21.0)	
Low Knowledge			<0.001
High Knowledge	34 (79.1)	17 (39.5)	
Adherence	9 (20.9)	26 (60.5)	
Pre-test			
Low Adherence			0.825
High Adherence	17 (39.5)	16 (37.2)	
Post-test	26 (60.5)	27 (62.8)	
Low Adherence			<0.001
High Adherence	31 (72.1)	13 (30.2)	
Stages of Behavior Change	12 (27.9)	30 (69.8)	
Pre-test			
Precontemplation			0.085
Contemplation	8 (18.6)	1 (2.3)	
Preparation	3 (7.0)	5 (11.6)	
Action	22 (51.2)	23 (53.5)	
Post-test	10 (23.2)	14 (32.6)	
Precontemplation			0.024
Contemplation	8 (18.6)	3 (7.0)	
Preparation	8 (18.6)	2 (4.6)	
Action	18 (41.9)	19 (44.2)	

Table 6 shows the comparison of knowledge level, adherence level, and stages of behavior change between the control and intervention groups at pre-test and post-test measurements. At baseline, there was no significant difference in the proportion of participants with low and high knowledge between the control and intervention groups ($p = 0.610$). However, a substantial improvement was observed after the intervention, where the proportion of participants with high knowledge in the intervention group increased from 21.0% at pre-test to 60.5% at post-test, which was significantly higher than the control group ($p < 0.001$). A similar pattern was observed for adherence. No significant difference was found at pre-test ($p = 0.825$), with both groups showing comparable distributions of low and high adherence. Following the intervention, the proportion of participants with high adherence increased markedly in the intervention group (69.8%), compared to the control group (27.9%), yielding a significant difference ($p < 0.001$). Regarding stages of behavior change, both groups demonstrated similar distributions at pre-test ($p = 0.085$). After the intervention, the intervention group showed a notable shift in behavioral readiness, with a higher proportion of participants reaching the action stage (44.2%) compared to the control group (20.9%). This difference was statistically significant ($p = 0.024$), indicating that the intervention contributed meaningfully to advancing participants through the stages of behavioral change.

Theoretically, educational and communicative interventions such as brief counseling and illustrated booklets can enhance pregnant women's understanding of the importance of routinely consuming iron-folic acid (IFA) supplements, the possible side effects, as well as the long-term benefits for both the mother and the fetus. This increase in knowledge subsequently encourages changes in attitudes and behaviors, which is reflected in better adherence to IFA consumption. As

a result, improved adherence affects the increase in hemoglobin levels, serving as an objective outcome of anemia status.

A study conducted to explore how the addition of medical illustrations and their styles influence information, perceptions of educational materials, and beliefs regarding a disease has been performed previously. The study suggested that images in educational books help improve the comprehension of health information and enhance the visual appeal of the material (Krasnoryadtseva et al., 2020). According to Listyarini (Listyarini & Fatmawati, 2020), booklets have two advantages over other media. They can be studied at any time because they are designed in book form and contain more comprehensive information. Booklets are chosen as health education tools because they disseminate information in a relatively short time and improve pregnant women's knowledge. With these small booklets, pregnant women receive education, and their adherence to iron tablet consumption increases (Mardiana et al., 2022). The advantages of using booklets include complete and easy-to-understand information, a more attractive design that sustains interest in reading, and their portability (Suryani et al., 2022). This study aligns with a previous quasi-experimental study with a pretest–posttest design conducted in two cities in Aceh Province, Indonesia, in which health education using illustrated booklets focusing on pregnant women's adherence to iron supplementation significantly increased after the intervention program (Nahrisah et al., 2020b).

Behavioral changes observed at the action stage demonstrated an improvement in cognitive (knowledge), affective, and psychomotor aspects. This is consistent with Saputri's 2020 study (Saputri et al., 2019) showing that educational interventions (5A brief counseling) provided by pharmacists, along with motivational messages, can improve behaviors and clinical outcomes in patients with diabetes mellitus. In this study, the 5A brief counseling intervention was combined with illustrated booklets. Researchers provided education to anemic pregnant women using booklets depicting a pregnant woman.

The illustrations in the booklet used attractive colors to encourage reading interest. The booklet contained explanations about anemia, iron-rich foods and nutrients that stimulate hemoglobin production, information about IFA tablets, proper consumption methods, and a short prayer that mothers could practice while reading. The use of illustrated booklets has been shown in several previous studies to improve hemoglobin outcomes, knowledge, and adherence among pregnant women using iron supplements (Ambarwati & Sulastri, 2023; Nahrisah et al., 2020c).

Brief counseling interventions by pharmacists using illustrated booklets have been proven to significantly improve adherence, knowledge, and behavior among anemic pregnant women consuming iron tablets. This approach utilizes the 5A strategy—which includes assessing, advising, agreeing, assisting, and arranging follow-up—to enhance the effectiveness of counseling interventions. The use of illustrated booklets as supplemental educational media plays an important role in strengthening understanding and adherence to iron supplementation regimens.

Studies have shown that counseling interventions, particularly those involving pharmacists, significantly increase adherence to iron supplementation among pregnant women. For instance, a study conducted in Bogor Regency found that both counseling and leaflet interventions significantly improved adherence to iron tablet consumption, with no statistical difference between the two methods, indicating the effectiveness of counseling in improving adherence (Vernissa et al., 2017b). Counseling interventions using illustrated booklets have also been shown to significantly improve knowledge about anemia and the importance of iron supplementation. For example, a study in Bukittinggi reported significant improvements in knowledge scores among pregnant women after receiving booklet-based education (Agus & Evareny, 2022).

The combined use of illustrated booklets and counseling has effectively promoted positive behavioral change. In a study conducted in Indonesia, the intervention group receiving illustrated handbook education and counseling showed significant improvements in hemoglobin levels, knowledge, and intake of iron-rich foods, indicating positive behavioral changes (Nahrisah et al.,

2020b). Other studies have highlighted that booklet interventions are more effective than leaflets in improving attitudes toward iron tablet adherence, suggesting that the visual and interactive nature of booklets can better engage pregnant women.

CONCLUSION

There is a significant effect in the form of increased knowledge, changes in behavioral stages, and improved adherence to IFA (TTD) consumption before and after the provision of 5A brief counseling accompanied by an illustrated booklet among anemic pregnant women in nine primary health centers in Malang City.

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AUTHOR CONTRIBUTION STATEMENT

RNA conceived the study and analyzed the data; AA helped design the study and review the manuscript; SU build and reviewed the instruments; and DNR and NLRA helped collecting the data. The final paper was reviewed and approved by the authors.

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